Photovoltaic DER System Could Save USPS $25,000 per Year in Marina del Rey, California

The U.S. Postal Service is demonstrating how to save energy, money, and the environment by adding a solar electric system as a distributed energy resource to reduce peak demand.

FEMP
FEDERAL ENERGY MANAGEMENT PROGRAM

Distributed Energy Resources

Case Study

Overview

In a variety of projects, government agencies are demonstrating the economic and environmental value of using distributed energy resources to provide reliable electricity for Federal facilities. These projects show how renewable distributed energy resources (DER) can be effectively integrated into utility power grids to provide added power during peak demand periods in populous regions of the nation.

In one recent demonstration project, the United States Postal Service (USPS) worked with the U.S. Department of Energy (DOE) Federal Energy Management Program (FEMP) to install a photovoltaic (PV) DER system at the USPS Marina Processing and Distribution Center in Marina del Rey, California. In this collaborative project, the agencies were assisted by a national laboratory, the local utility, and private-sector companies. As a result, a 127-kilowatt (kW) rooftop PV system—the largest roof-integrated Federal system in the nation—now generates electricity for the Marina Center directly from sunlight. This PV system is expected to shave up to 10% off the facility's 1.2-MW peak power demand and save approximately $25,000 per year in utility costs.

George Marsh/PIX11017

Project partners (left to right) Joe VandenBerg and Ray Levinson of the U.S. Postal Service and Dan Shugar of PowerLight Corp. worked together to install this 127-kilowatt photovoltaic system on the USPS Marina Center's rooftop; the local utility, Los Angeles Department of Water and Power, was also a major contributor to the project.

Benefits of Distributed Energy Resources

Distributed energy resources such as internal combustion engines, photovoltaics, wind systems, microturbines, fuel cells, and energy storage systems can benefit Federal facilities in ways like these:

- Provide supplemental electric power at times of peak demand (peak shaving)
- Help reduce utility-related electric and demand charges
- Enable facilities to respond quickly to changing needs because of their modularity
- Add capacity to the utility grid without the need for a new power plant
- Enhance reliability and power quality
- Enhance energy security by ensuring fuel diversification and power for critical loads
- Assist in reducing air emissions.

Background

Californians have experienced several serious energy supply and delivery problems in the past few years. In some areas, not enough power has been generated to meet peak demand, and utility line capacity has not been sufficient to carry all the power that customers need during peak demand periods. DER

U.S. Department of Energy
Office of Energy Efficiency and Renewable Energy

George Marsh/PIX011015

The rooftop solar system at the USPS Marina del Ray Center in Los Angeles is based on a technology that uses polystyrene foam backing behind the PV cells, which also provides more thermal insulation to the building; the system should save about $25,000 per year in energy costs.

systems can help solve problems like these by offsetting some of the demand on the power grid when the systems are installed close to the customer's load.

DER systems are small, decentralized, grid-connected or off-grid power-generating technologies located at or near the place where the energy is used. Some DER systems—such as microturbines—run on conventional fossil fuels. Others—such as solar and wind systems—depend on renewable energy resources.

A solar DER system was chosen for the USPS Marina Processing and Distribution Center in Marina del Rey, which is in sunny Los Angeles County. The 409,630-square-foot center, which processes millions of pieces of mail every day, obtains electricity from the Los Angeles Department of Water and Power (LADWP). LADWP offers, as part of its Solar Roofs Incentives Program, a rebate of up to $6/W to customers who install PV systems. To qualify for the rebate, the PV system must be at least 300 kW and may not produce more power than the facility uses.

The utility rebate—as well as the excellent solar resource, adequate roof area, demonstrated system reliability, and low maintenance requirements—made PV the clear choice. The USPS was committed to carrying out this project to meet California's need to reduce peak demand on the local grid, control costs, and help reduce the air emissions associated with many forms of energy use.

Project Summary

The USPS began by conducting a roof assessment at the Marina Center, which indicated that the roof could easily withstand the load of a solar energy system. The size of the PV system was restricted to less than 1 MW, primarily to keep expenses within project funding limits. Next, with technical assistance from staff at Lawrence Berkeley National Laboratory (LBNL), PowerLight Corporation was chosen to design the PV system and coordinate the installation. PowerLight partnered with Siemens & Shell Solar to custom-manufacture the system to meet the needs of the center.

A PowerGuard® PV system was then designed, built, and installed in six months. This system incorporates PV cells backed with polystyrene foam to produce power, increase the building's thermal insulation, and extend the life of the roof. The PV system, which sits on 15,000 square feet of the center's flat roof, increases the effective R-value of the built-up roof. Workers did not have to penetrate the roof during the PV system installation.

"Lawrence Berkeley National Laboratory, acting on behalf of FEMP, provided invaluable assistance to this project. They helped us select the best technologies, determine the proper system size, choose a location, and acquire financial support. I would urge any Federal agency considering a similar project to seek their assistance."

—Ray Levinson, Area Environmental Manager, USPS

The PV system will not be a backup source of power if a blackout should occur, however. For safety reasons, if the power supply in the grid is interrupted, an automatic disconnect on the PV system will suspend operation until the grid is up and running again.

Although it does not provide power during blackouts, the PV system has a role in improving energy efficiency at the facility. The system is linked to a CMS Viron Energy Services energy management system (EMS) that monitors power output from the solar cells. When the EMS detects a decline in the system's power output (for example, as a result of cloud cover), the EMS automatically modifies the operation of the building's chiller, air handlers, and blowers without affecting the comfort levels of people in the building. This should significantly reduce the building's energy demand and help reduce demand charges caused by power surges.

In fact, the USPS Marina Center is expecting up to a 10% reduction in its current 1.2-MW peak demand.

As part of the project, PowerLight will monitor and evaluate the system for two years, providing quarterly reports to the USPS. These performance assessments will be used to determine how well the system is operating, the total savings provided, and the potential for future installations of this type.

Financing for the project came from several sources. Because appropriated funds were not sufficient to cover all costs, project managers had to look for alternative sources of funding. They found that the $6/W rebate offered by LADWP allowed them to install a renewable energy system at a fraction of its usual cost. They also responded to a call for projects issued by DOE FEMP that asked Federal agencies to submit ideas for DER projects. The call for projects allowed agencies to apply for a portion of $200,000 in Federal funding offered for DER hardware purchases and technical assistance services.

The demand for DER funds was high; 89 applications were received, and 20 projects were ultimately funded. By combining FEMP funding with the rebate from the local utility, the Marina Center's project managers were able to reduce their share of the total cost to $225,000, which was paid for out of USPS energy conservation funds. By leveraging these multiple sources of funding, the USPS was able to install a renewable energy DER system with a payback period of less than 10 years, which compares well with paybacks for other energy efficiency projects.

George Marsh/PIX11016

The rooftop solar system at the USPS Marina Center is linked to an energy management system that monitors power output from the PV cells and modifies the building's air-handling and cooling systems, as needed.

About the USPS PV DER System

System Rated Power	127 kW
Estimated Annual Energy Savings	
Electricity Generated	228,600 kWh
Peak Demand Reduction	120 kW
Energy Cost Savings	$25,000
System Economics	
Total PV System Cost	$1,033,000
LADWP Utility Rebate ($6/W)	$683,000
FEMP DER Equipment Funding	$125,000
System Cost to USPS *(Using USPS Energy Conservation Funds)*	$225,000
Simple Payback Period *(Considering USPS Funds Only)*	9 years

Benefits of Using PV Systems for DER Applications

DER systems like this one can provide a hedge against fluctuating electricity prices, enhance energy security by offsetting some demand for utility power, and help reduce harmful emissions. In some areas, DER systems may even eliminate the need for new or expanded power plants.

The new DER PV system at the Marina Center should save the USPS up to $25,000 per year through peak shaving. Peak-shaving devices provide power for high-demand periods, eliminating excessive demand and time-of-use charges and helping to avoid community-wide power shortages.

PV systems are especially well suited for peak-shaving applications at many Federal facilities because peak electrical loads usually occur when the solar resource is greatest (for example, from morning until late in the afternoon). A consistent reduction in demand also benefits other customers on the electricity grid, particularly in capacity-constrained areas.

This 127-kW PV system is designed to produce approximately 228,600 kWh per year. And the system will save enough energy to avoid 104 lb of NO_x, 3 lb of SO_2, and 16 tons of CO_2 emissions each year. It will save money, as well, not only because of the peak power it produces but also because it adds insulation, and thus reduces cooling needs, inside the building.

Lessons Learned

By taking advantage of valuable utility rebates, as well as the assistance offered by DOE FEMP and LBNL, the USPS saved almost 80% of the initial cost of a similar system funded without rebates or other support. The Marina Center system cost just under $2/W, a bargain price for a PV DER system. This shows the considerable economic benefit that can be obtained by using all available incentives and assistance in carrying out Federal DER projects. States like California, which offer significant rebates and state public benefit funds for DER projects, are excellent places for Federal agencies to focus on DER projects.

Looking Ahead

This PV DER demonstration project is helping the USPS to answer California's call to reduce electricity demand in that state. It also demonstrates how Federal agencies can move forward with DER projects without appropriated funds. Performance measurements will help to determine whether similar projects will be implemented at other USPS centers, and they should clearly show the benefits of Federal DER projects.

For More Information

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